

In the claims:

1-37 (Canceled).

38. (currently amended) A method of multinuclear magnetic resonance spectroscopy and imaging comprising the steps of:

generating an exciter signal;  
synthesizing a plurality of synthesized signals appropriate to the atomic species to be studied;  
mixing the exciter signal with the plurality of synthesized signals, creating a plurality of generated signals;  
exciting a molecule containing a plurality of atoms having different atomic weights with the plurality of generated signals to decouple the atoms of different atomic weights;  
receiving a plurality of experimental signals within different Larmor frequency ranges from the plurality of decoupled atoms of the molecule excited by the plurality of generated signals.

39. (Original) The method of multinuclear magnetic resonance spectroscopy and imaging of claim 38 further comprising:

mixing the received experimental signals with a plurality of corresponding synthesized signals, thereby creating a plurality of final signals.

40. (previously presented) The method of multinuclear magnetic resonance spectroscopy of claim 39 further comprising:

exciting atoms with the exciter signal; and  
receiving an exciter experimental signal.

41. (currently amended) An apparatus for multinuclear magnetic resonance spectroscopy comprising:

means for generating an exciter signal;  
means for synthesizing a plurality of synthesized signals appropriate to the atomic species to be studied;  
means for mixing the exciter signal with the plurality of synthesized signals, creating a plurality of generated signals;  
means for exciting a molecule containing a plurality of atoms having different atomic weights with the plurality of generated signals

to decouple atoms of the plurality of atoms of different atomic weights;

means for receiving a plurality of experimental signals within different Larmor frequency ranges from the plurality of decoupled atoms of the molecule excited by the plurality of generated signals.

42. (Original) The apparatus for multinuclear magnetic resonance spectroscopy of claim 41 further comprising:

means for mixing the received experimental signals with a plurality of corresponding synthesized signals, thereby creating a plurality of final signals.

43. (Original) The apparatus for multinuclear magnetic resonance spectroscopy as in claims 42 further comprising:

means for exciting atoms with the exciter signal; and  
means for receiving an exciter experimental signal.

44. (Original) The method for multinuclear magnetic resonance spectroscopy of claim 39, further comprising:

digitizing the final signals.

45. (Original) The method for multinuclear magnetic resonance spectroscopy of claim 40, further comprising:

digitizing the final signals; and  
digitizing the exciting experimental signal.

46. (Original) The apparatus for multinuclear magnetic resonance spectroscopy of claim 42, further comprising:

means for digitizing the final signals.

47. (Original) The apparatus for multinuclear magnetic resonance spectroscopy of claim 43, further comprising:

means for digitizing the final signals and the exciter experimental signal.

48. (Original) The apparatus for multinuclear magnetic resonance spectroscopy of claims 47, wherein the means for digitizing each of the signals further comprise separate devices.

49-68 (Canceled) .